Eye on the Sky

National Weather Service
Louisville, Kentucky

Summer 2002
Volume 3, Issue 2

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A Newsletter for Emergency Managers, Core Storm Spotters, Media, and Public Officials in our County Warning Area.

The UV Index and You

Courtesy: Environmental Protection Agency

Some exposure to sunlight can be enjoyable; however, too much can be dangerous. Overexposure to the sun's ultraviolet (UV) radiation can cause immediate effects such as sunburn and long-term problems such as skin cancer and cataracts. Developed by the National Weather Service (NWS) and Environmental Protection Agency (EPA), the UV Index provides a daily forecast of the expected risk of overexposure to the sun's harmful rays.

The Index predicts UV intensity levels on a scale of 0 to 10+, where 0 indicates a minimal risk of overexposure and 10+ means a very high risk. Calculated on a next-day basis for dozens of cities across the United States, the UV Index takes into account clouds and other local conditions that affect the amount of UV radiation reaching the ground.

Index Number	*Exposure Level*
0 to 2	Minimal
3 to 4	Low
5 to 6	Moderate
7 to 9	High
10+	Very High

By taking a few simple precautions, you can greatly reduce your risk of sun-related illnesses. To be "SunWise," consider the following steps:

Limit your time in the sun between 10 am and 4 pm local time.
Whenever possible, seek shade.
Use a broad spectrum sun screen with an SPF of at least 15.
Wear UV-protective sunglasses.
Wear a wide-brimmed hat and if possible, full-length clothing.
Avoid sunlamp and tanning salons.
Listen for the UV Index daily.

While you should always take precautions against overexposure to the sun, take special care when the UV Index predicts levels of moderate or above. NWS Louisville broadcasts daily Index information on NOAA Weather Radio from 4 am to 4 pm edt for the following cities: Louisville, Charleston, Cleveland, Chicago, Indianapolis, Memphis, and St. Louis. For more information, call the EPA's Stratospheric Ozone Information Hotline at 800-296-1996.

Inside this Issue...

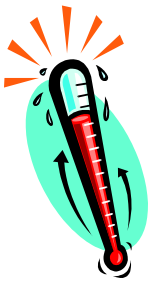
Summer's Heat and Humidity

by Marilyn Scholz, Forecaster

Summer is nearly here. Since the official start of summer is in mid June, now is the time to think about how to protect yourself from the heat and humidity. Heat kills more people in the United States than lightning, tornadoes, hurricanes, floods, and earthquakes. Countless others suffer from heat-related illnesses. These illnesses result when the body is unable to shed enough heat or when the body is unable to compensate for the fluids and salt lost through perspiration, and ultimately the body's core temperature rises.

The NWS uses the ***Heat Index*** (HI) or "apparent" temperature to alert the public about high heat and humidity. The HI is a combination of the surface temperature and relative humidity (moisture). The higher the humidity for a particular temperature, the greater the heat index. When the daytime HI is expected to reach at least 105 F for three hours or more and the nighttime HI remains near or above 80 F, the NWS will issue a ***Heat Advisory***. When the HI is expected to be 115 F or higher, an ***Excessive Heat Warning*** will be issued. Conditions that might prompt a heat warning are temperatures near or above 100 F along with elevated humidity.

Heat related illnesses, such as sunstroke, heat cramps, and heat exhaustion, also are possible with HI's below 105 F given prolonged exposure to the heat and/or physical activity. As we get older, we also are more susceptible to the heat.



During very hot periods, precautions you can take to reduce the risk of heat illness include 1) wear lightweight, light-colored clothing, 2) drink plenty of non-alcoholic fluids, 3) slow down during the heat of the day, 4) spend more time in air-conditioned places, and 5) stay out of the sun, if possible. Also, check on the elderly and small children, and don't forget your pets.

No one knows for sure what the summer will bring, but central Kentucky and south-central Indiana typically have a number of days with temperatures in the 90s, and possibly even around 100. We had temperatures above 100 as recently as 1999. If we are prepared, we can survive the heat and humidity. More information on heat waves is available on the web at *weather.noaa.gov/weather/hwave.html.*

New NOAA Weather Radio Voices and Streaming Audio

by Chris Smallcomb, Forecaster

In late April, NWS Louisville activated the new NOAA Weather Radio (NWR) computerized voices through the use of the Voice Improvement Processor. Since then and at least for the foreseeable future, "Craig," "Donna," and the original voice ("Igor") will broadcast simultaneously to give listeners a gradual adaptation period to the new voices and to provide a variety previously lacking on NWR.

Work is underway to ensure that Craig and Donna pronounce local place names correctly. Until they "learn" these phrases, the pair only will broadcast products that contain few or no local names, including the zone forecast, climate, ultraviolet index, and regional weather summary. Igor will continue to handle the remainder of the products, including short term forecasts and any severe weather watches and warnings. Several of our listeners have complained that Donna is a bit hard to understand and talks too fast. Thus, we will attempt to make modifications to the software so that she is easier to understand in the future.

Currently, it is our long-term goal eventually to transition to the new voices, with all products broadcast by Craig and Donna. However, if listener feedback and our own judgment suggest, we may retain all three voices permanently. If you have any comments about Craig, Donna, or Igor, please contact us via phone, letter, or e-mail. What we do or don't do with the new voices is really up to you, our customers.

In late May, we also implemented streaming audio feeds of our NWR broadcast on the Internet. Thus, you can now listen to NWR from your desktop or laptop computer. This should prove especially useful for those areas where reception of the NWR broadcast is difficult. Links to each of the audio feeds may be found on our web page at *www.crh.noaa.gov/lmk/nwr.htm*.

Tabular State Forecast Expanding to Seven Days

by Tony Sturey, Senior Forecaster

NWS Louisville is at the forefront of several national initiatives, which ultimately will provide enhanced products and services to our users. One such initiative is the seven-day tabular state forecast. On March 1, 2001, the state forecast product for Kentucky changed from a narrative format to a five-day tabular format. On June 1, 2002, the tabular format was extended to seven days.

This seven-day tabular format provides forecasts for 22 locations across Kentucky. For each location listed, the daily

predominant (daytime) weather will be given, along with daytime probabilities of precipitation. Meanwhile, previous night's low temperatures and daytime high temperatures will be referenced. As other NWS offices employ this tabular format, you will be able to gather site-specific, seven-day forecasts for many cities and towns around the country.

New Cooperative Observers

by Larry Dattilo, Data Acquisition Program Manager

The NWS Cooperative Observer Program (COOP) is truly the nation's weather and climate observing network. More than 11,000 volunteers nationwide take observations on farms, in urban and suburban areas, seashores, and mountaintops. The data is representative of where people live, work, and play. NWS Louisville wishes to welcome two new cooperative observers to our family and to say thanks to all of our observers for supporting us in our efforts to serve the people of south-central Indiana and central Kentucky.

Cecil Lyons and his wife Tina are residents of Scottsville in Scott County, Indiana. Cecil will report daily high and low temperatures and 24-hour rainfall amounts. Cecil became interested in weather while in the Air Force in Texas. While marching with his squad, he was ordered to "hit the ground" as a funnel cloud moved directly overhead. Cecil works as a dispatcher with the EMA in Scott County.

Eye on the Sky is a quarterly newsletter published by the National Weather Service in Louisville, Kentucky for the benefit of Emergency Managers, core storm spotters, local media outlets, and certain public officials within our county warning area. Comments and suggestions are always welcome.

Please contact us by phone at **502-969-8842**, or send us an email at **w-lmk.webmaster@noaa.gov**

Or, you also may contact us by mail at

National Weather Service
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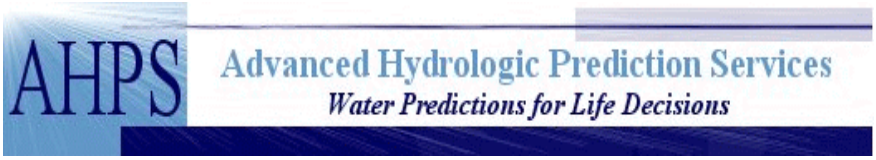
www.crh.noaa.gov/lmk/

Chief Editors: Van DeWald and Ted Funk

Greg Brown and his wife Ann live in Lexington, Indiana, also in Scott County where they have resided for 20 years. Greg also will report daily high and low temperatures and 24-hour rainfall amounts. Greg is a retired mechanical engineer and enjoys watching the weather and gardening. Greg also owns a stained glass studio and some of his work can be seen in businesses in nearby Scottsville.

Advanced Hydrologic Prediction Services

by Mike Matthews, Meteorologist In Charge



The National Weather Service in Louisville conducted a hydrologic customer workshop on May 30, 2002. Representatives from the NWS Central Region Headquarters in Kansas City, Missouri joined colleagues from the Kentucky NWS offices in Louisville, Jackson, and Paducah, and personnel from the Ohio Basin River Forecast Center in Wilmington, Ohio.

Many rapid changes have taken place in technology and in the delivery and presentation of information. As a result, the workshop allowed us to gain a better understanding of customer weather requirements and to ensure that we were effectively meeting their needs. We are now providing products and information in a variety of new methods, including probabilistic and graphical hydrologic information on the Internet. We began delivery of new hydrologic information through the Advanced Hydrologic Prediction Services (AHPS) in the past year. A major goal was to make sure customers knew what we had to offer and make certain it was what they needed.

The meeting was very successful because we obtained their ideas and opinions on how to improve our hydrological products and services. This was a tremendous opportunity to learn from each other and work together toward a long-term common goal of delivering professional service.

Please check our web page at *www.crh.noaa.gov/lmk/ahps/* for a complete listing of the hydrological products produced by NWS Louisville. You will find hydrographs for each of the river points we forecast for, along with historical flood crests, low water records, and photos of the surrounding area for each site. Probabilistic forecasts will be available by 2005.

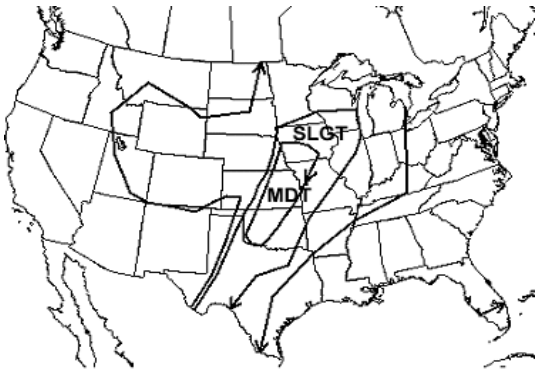
The SPC: Our Partner in the Protection of Life and Property

By Don Kirkpatrick, Senior Forecaster

In our last newsletter, we examined the partnership between the NWS's Storm Prediction Center (SPC) in Norman, Oklahoma and the NWS Forecast Office in Louisville in protecting life and property. In this issue, we will scrutinize the severe storms forecast process, from SPC's outlooks to NWS Louisville's warnings.

SPC meteorologists are at the forefront of convective storm forecasting. They have a huge variety of tools at their disposal, including past and current weather observations from satellite imagery, radars, surface stations, balloon soundings, wind profilers, and the lightning detection network. These tools, combined with computer model forecasts, help SPC forecasters issue a suite of products beginning with the convective outlook.

The convective outlook is a large-scale forecast of potential severe thunderstorm development areas around the country. The traditional three-day outlooks are labeled "SLGT" (slight risk), "MDT" (moderate risk), or "HIGH" (high risk) depending on the coverage and intensity of expected severe storms.



A SLGT risk implies that well-organized severe storms are expected but in small numbers and/or low coverage. Within a slight risk area, less than 30 reports of 1 inch or larger hail and/or damaging wind events are forecast, as well as up to 3-5 tornadoes. A MDT risk implies a greater concentration and magnitude of severe thunderstorms. More than 30 reports of hail 1 inch or larger and/or damaging wind events are predicted, along with 6-19 tornadoes. A HIGH risk area implies a major severe weather outbreak is expected, with the greatest coverage of severe storms and a heightened likelihood of extreme wind events and strong or violent tornadoes. More than 20 tornadoes are anticipated with at least two of them rated F3 or higher, along with over 50 damaging wind reports (including some 80 mph or higher reports).

A Public Severe Weather Outlook (PWO) usually accompanies a high risk and is issued by the SPC when a potentially significant or widespread tornado outbreak is expected. This forecast typically is issued 12 to 24 hours prior to the event and alerts NWS offices, the media, and other users concerned with public safety of a potentially rare and dangerous situation.

As a severe threat becomes better defined in space and time, SPC forecasters normally disseminate a Mesoscale Convective Discussion (MCD). MCDs are composed when conditions appear favorable for severe storm development, normally 1 to 3 hours before the issuance of a severe weather watch. Meteorological rationale in the discussion centers on cause and type of convection, which enhances analyses by forecasters at NWS Louisville.

The next step is the severe thunderstorm or tornado watch. Tornadoes can occur in either situation, but are more common in tornado watch areas. Watches provide valuable lead time for emergency managers, storm spotters, and the broadcast media to gear up operations and increase staffing. They also encourage the general public to stay alert for changing weather conditions and possible warnings. Watches across the country are numbered sequentially with the count reset on January 1. A typical watch has a duration of 4 to 6 hours.

When conditions are favorable for a major outbreak of severe weather, the SPC often will highlight watches with the following enhanced wording: ***"This is a particularly dangerous situation with the possibility of damaging tornadoes. Also, very large hail, damaging thunderstorm winds, and dangerous lightning can be expected."*** Comparable wording not mentioning tornadoes may be used for destructive thunderstorm straight-line wind events as well.

The most critical step in the severe storms forecast process is the issuance of warnings by meteorologists at local NWS offices. When large hail (at least 3/4-inch in diameter), damaging winds (at least 50 knots or 58 mph), or a tornado appear imminent, NWS Louisville will issue a **Severe Thunderstorm** or **Tornado Warning**, as appropriate. Warning decisions primarily are based on a skilled assessment of 1) storm environmental parameters, 2) storm structure and evolution, and 3) NWS Doppler radar signatures and trends.

Radar technology has advanced a great deal, allowing meteorologists to peer into storms and actually detect the shear associated with a tornadic storm or one producing wind damage. However, it often takes the observation of a trained spotter to determine if a funnel cloud has developed or reached the ground, or if strong winds have toppled trees and done structural damage. As a result, coordination with NWS spotters and emergency managers is an essential component of the warning and verification processes.

The Importance of Storm Spotters

by Van DeWald, Forecaster

Real-time spotter reports are vital to the NWS mission of protecting life and property. Spotters are a great asset, and are the eyes and ears of the NWS in the field. Spotters have the potential to provide life-saving information to citizens in their own communities and in surrounding towns and counties as well. Real-time, accurate, detailed spotter reports boost forecaster confidence and help validate that a real hazard exists. Our advanced technology combined with trained volunteer storm spotters will continue to play an integral role in storm analysis and warning efforts for years to come!

There are many types of severe weather spotters, such as law enforcement, fire department personnel, EMS, emergency management, local media, and amateur radio operators. Spotting is not a one person job, and coordination between spotters is crucial for a successful event. It's also important for spotter groups within an area to share information with each other. But remember, the NWS values spotter safety much more than the observations you provide!

Peak severe weather season across south-central Indiana and central Kentucky is April, May, and June. However, severe storms can strike at *any* time of year and *any* time of day. That's why it's imperative that if you have hazardous weather related information to report, please call us as soon as possible. It's especially important to pass along information when seconds may save lives. If you do not report the information as it's happening, perhaps no one will. Our computers estimate hail size, wind speed, and tornado potential, but your reports give us a clearer picture of what actually is occurring in the affected area.

We thank you very much for your efforts, and hope that you will continue to submit timely, detailed, and accurate reports of severe weather in the future to help save lives and property across south-central Indiana and central Kentucky.

Spotter Contact List Update

by Van DeWald, Forecaster

Each year as we present volunteer spotter training seminars, interested citizens sign up to be spotters by providing their names, locations, and telephone numbers.

We keep this information on file so we may contact them as needed when severe storms pass across their neighborhoods. Through the years, however, some of the people may have moved, lost interest in the program, or even passed away.

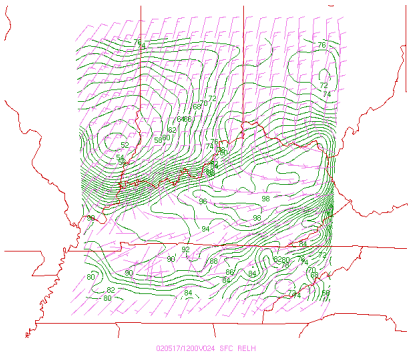
Thus, over the last few weeks we have made a concentrated effort to update our volunteer severe storm spotter list. We have contacted the hundreds of spotters within our database to check 1) their interest in participating, 2) their current address, and 3) the hours they may be contacted. The effort proved worthwhile, and we now have an up-to-date and accurate listing of severe storm spotters across our county warning area.

New Technology: The MM5 at NWS Louisville

by Chris Smallcomb, Forecaster

Forecasters at NWS Louisville have begun using output from a locally-run mesoscale forecast model called the MM5. The NWS currently utilizes output from computer forecast models on a national and global scale (i.e., the ETA and AVN models), but the MM5 allows us to have model computations on a *much* finer/smaller scale that is focused on NWS Louisville's forecast area.

Our goals are not only to eventually produce higher resolution forecasts of temperatures, winds, and other variables, but also to incorporate local observations and techniques that are not available within the national or global-scale models. Some of these techniques will be geared toward severe storms, winter weather, and fog and aviation forecasting around the region, which ultimately should help us produce more detailed and accurate forecasts. The image at right is an example of the output from the MM5.



New Forecasters at NWS Louisville

Hello, my name is John Denman, and I arrived at this office on March 10 as a forecaster. I previously served in Pendleton, Oregon since 1998 as a meteorologist intern. Before working for the National Weather Service, I attended the University of Oklahoma from 1991-1996 and earned a Bachelor of Science degree in Meteorology. I enjoyed storm chasing and worked as an assistant on the VORTEX project during 1994-1995. VORTEX was a field experiment conducted by the National Severe Storms Laboratory which attempted to measure atmospheric conditions that would lead to tornadoes. With VORTEX, I drove a vehicle with mounted weather sensors and launched atmospheric balloons to sample the near storm environment near tornadoes.

Prior to attending college in Oklahoma, I served with the United States Navy as a machinist's mate aboard a nuclear powered submarine, the USS Lafayette. Over the course of 4 years, I made 8 deterrent patrols in the North Atlantic.

Hello, my name is James Brotherton, and I joined the NWS Louisville team in January 2002. I was born in 1976 in Columbus, Indiana, spent 8 years growing up near St. Joseph, Missouri, and also lived in Nashville, Tennessee, and Indianapolis and Terre Haute, Indiana. In 1999, I earned a Bachelor of Science degree in Meteorology from Purdue University.

My first work experience within the NWS was as an internship at the Climate Prediction Center in Washington, DC. I worked at both the NOAA Science Center and the Joint Agricultural Weather Facility located at the USDA headquarters. My first full time position within the NWS was at the Charleston, South Carolina office as a meteorologist intern. While in Charleston, I worked a few tropical storm events, including tropical storm Gordon in 2000 when both the Georgia and South Carolina coasts were under tropical storm warnings.

We welcome both John and James to the NWS Louisville staff!

Hydrology Highlights

by Mike Callahan, Service Hydrologist

Soil moisture conditions at the beginning of 2002 were about normal, which was a change from the drought experienced for the last three years. January precipitation was near normal, but February was dry which raised fears that a new drought might establish itself in the Ohio Valley. These fears were compounded by a developing El Nino pattern.

However, episodes of heavy rain arrived in March and continued through much of the spring. By the end of May, precipitation totals for 2002 in northern Kentucky and southern Indiana were 6 to 9 inches above normal, and 1 to 3 inches above across east-central and southern Kentucky.

Flooding occurred in March, which was the worst experienced in central Kentucky since 1997. Some property damage occurred but no injuries were reported. Minor flooding also was reported in January, April, and May.

The soggy soils in the region had an impact on agriculture by delaying spring planting, especially in the north. However, the heavy rains were useful in raising groundwater levels, which were depleted from the previous drought. The outlook for this summer calls for near normal temperatures and slightly above normal precipitation, so a prolonged drought hopefully will not occur in the Ohio Valley through August.

Climatology Highlights

by Pat Waidley, Hydrometeorological Technician

This spring was wet with highly variable temperatures across southern Indiana and central Kentucky. In Louisville, this spring was the third wettest on record with 22.07 inches of rain from March 1 to May 31, or 8.87 inches above normal (the wettest spring was in 1997 with 26.74 inches). Yearly rainfall to date is only about 16 inches away from the normal for all of 2002. Temperatures were above normal in April, but below in March and May. In fact, May was quite unusual with a record-breaking cold snap in mid May sandwiched between warm weather early and late in the month. High temperatures only reached the upper 50s to lower 60s from May 18-21 with lows from 35 F to 41 F for 5 consecutive days, which set several new records. In fact, a low of 35 F on May 19 was the coldest ever for that late in the spring. Scattered frost also was reported.

In Lexington, 17.15 inches of rain fell from March through May, or 4.29 inches above normal. Temperatures also varied significantly in Lexington, with the May cold snap resulting in record lows on May 19, 21, and 22. A low of 32 F on May 19

was the coldest ever recorded for so late in the spring. High temperatures only reached the mid to upper 50s from May 18-21. Temperatures rebounded into the 80s by late May.

Bowling Green also experienced a wet spring, which was a welcome change from the drought throughout much of 2001. Precipitation for March through May was 18.63 inches, or 4.31 inches above normal. The spring temperature pattern was similar to that of Louisville and Lexington. The May cold snap resulted in highs only in the lower 60s from May 18-21 with lows in the mid 30s on May 19 and 22, which set two new record lows. The low of 35 F on May 22 also was the coldest ever recorded for that late in the spring.

Louisville	**Average Temp.**	**Departure**	**Precipitation**	**Departure**	**Yearly Departure**
March	44.7 F	-2.2 F	8.47"	+4.06"	
April	58.6 F	+2.2 F	6.61"	+2.70"	
May	62.5 F	-3.3 F	6.99"	+2.11"	+8.97"
Lexington	**Average Temp.**	**Departure**	**Precipitation**	**Departure**	**Yearly Departure**
March	44.5 F	-1.1 F	7.58"	+3.17"	
April	57.8 F	+3.2 F	5.28"	+1.61"	
May	61.2 F	-2.6 F	4.29"	-0.49"	+1.44"
Bowling Green	**Average Temp.**	**Departure**	**Precipitation**	**Departure**	**Yearly Departure**
March	46.6 F	-1.2 F	7.60"	+2.63"	
April	59.6 F	+2.8 F	5.67"	+1.68"	
May	63.5 F	-2.3 F	5.36"	0.00"	+0.95"

Normal High/Low Temperatures/Monthly Precipitation				
Location	**June 1**	**July 1**	**August 1**	**September 1**
Louisville	80 /61 /3.76"	86 /69 /4.30"	87 /70 /3.41"	83 /65 /3.05"
Lexington	80 /59 /4.58"	85 /66 /4.80"	86 /66 /3.77"	82 /62 /3.11"
Bowling Green	82 /60 /4.29"	88 /67 /4.54"	89 /67 /3.36"	85 /63 /5.10"

Verification of Severe Storms and Flash Floods

by Norm Reitmeyer, Warning Coordination Meteorologist

Verification is defined as confirmation of truth or authority. Verification of tornado, severe thunderstorm, or flash flood warnings is confirming they did or did not occur, i.e., a significant challenge in dealing with severe weather. It is vital we understand how an episode of intense storms was dealt with in order to evaluate our effectiveness in fulfilling our mission of protecting life and property. Did we issue timely and effective warnings, or not?

So far in 2002, we have verified 5 tornado warnings, all on April 28, including a warning for Breckinridge County issued 7 minutes before a tornado hit Irvington killing one person. Tornado warnings were issued for a few other counties on April 28, where substantial damage occurred but a tornado could not be confirmed. In more than one instance, observers reported rotation in clouds above the ground during a tornado warning, but touchdown was never confirmed. Officially, such

warnings do not verify. Tornado warnings can be difficult to verify at times, as the majority of tornadoes in Kentucky are small and quite short-lived (perhaps on the ground for as little as a minute). Thus, although a tornado warning may have been issued and a brief tornado may have occurred, the warning may go unverified due to a lack of visual confirmation (perhaps it occurred in a rural area or at night) or the inability to find or differentiate any damage from straight-line winds.

In 2002, we have issued 221 severe thunderstorm warnings with over 60 percent officially verifying through visual confirmation of wind damage or large hail. Almost 70 percent of 79 flash flood warnings have verified.

To be taken seriously, NWS offices must verify, or confirm, as many warnings as possible. If not, those in warned areas may begin to ignore warnings. Thus, a major verification effort is performed during and after severe weather events, including phone calls to dispatch centers, emergency management offices, storm spotters, and the media. Gaining an accurate understanding of what took place in a given area helps us become more effective when dealing with future severe weather events. Many of you can be of enormous assistance by reporting any severe weather you experience to our staff at NWS Louisville.

Astronomical Calendar

Louisville	**Sunrise**	**Sunset**
June 1	621 am edt	900 pm edt
July 1	623 am edt	910 pm edt
August 1	645 am edt	853 pm edt
September 1	713 am edt	813 pm edt

Lexington	**Sunrise**	**Sunset**
June 1	617 am edt	855 pm edt
July 1	619 am edt	905 pm edt
August 1	641 am edt	847 pm edt
September 1	708 am edt	808 pm edt

Bowling Green	**Sunrise**	**Sunset**
June 1	528 am cdt	800 pm cdt
July 1	530 am cdt	809 pm cdt
August 1	551 am cdt	753 pm cdt
September 1	617 am cdt	714 pm cdt

Moon Phases

New Moon	**First Qtr**	**Full Moon**	**Last Qtr**
Jun 10	Jun 18	Jun 24	Jul 2
Jul 10	Jul 17	Jul 24	Aug 1
Aug 8	Aug 15	Aug 22	Aug 31
Sep 7	Sep 13	Sep 21	Sep 29

Summer Solstice (Start of Summer)

June 21 at 9:24 am edt (8:24 am cdt)